Question 7:
What are the performance and cost differences between the two technologies?

Although the study summarized in this booklet focused on the environmental effects associated with computer displays, comparative cost and performance information are the other obvious considerations in a company's or consumer's decision-making. A complete analysis of cost and performance was beyond the scope of this study; however, summary performance and cost information are presented here.

Computer display performance

Performance data and costs for monitors on the market at the time of the study were collected (summer, 2001) and are presented in Table 7.1.

Table 7.1. Performance data and cost collected for some currently selling displays[a]

Monitor[a]	Display size (inches)	Resolution (pixels)	Brightness (cd/m^2)	Contrast ratio	Number of colors	2001 cost
CRTs						
Monitor 1	17/16	1280x1040	---	---	---	$158
Monitor 2	17/16.1	1280x1040	---	"High contrast, anti-static, anti-glare coating."	---	$171
Monitor 3	17/16	1600x1200	---	---	---	$316
LCDs						
Monitor 1	15.1	1024x768	---	200:1	16.7 million	$349
Monitor 2[b]	15.1	1024x768	200	250:1	16.7 million	$400
Monitor 3	15.1	1024x768	200[c]	200:1[c]	16+ million	$439
Monitor 4[b]	15.1	1024x768	200	250:1	16.7 million	$499
Monitor 5	15	1024x768	210[c]	350:1	---	$554

a All information from Vol. EC23 of the eCOST.com catalog, except where noted otherwise.
b Data from manufacturer's web site except for prices, which were obtained from http://www.cdw.com.
c Data from manufacturer's web site.

Performance of computer displays can be based on many factors, but is focused mainly on the quality of the image on the screen. This quality can be measured in terms such as display size, resolution, dot pitch, brightness, and contrast ratio. The performance characteristics presented in the table above include the following.

Display size. The CRT size advertised is generally not the size of the image on the screen, but the nominal size of the entire faceplate, including the part that is not visible. Instead, the viewable-image size (VIS), which is the diagonal measurement of the image on the screen, is the more meaningful metric. The VIS is typically about an inch smaller than the nominal size. An LCD's VIS is the same as its nominal size, making a 15-inch LCD nearly the equal of a 17-inch CRT. (The 17-inch CRT provides about 14 percent more viewable area than the 15-inch LCD.)

Resolution. This refers to the number of picture elements, or pixels, that constitute an image. Computer displays can usually can be set at various resolutions, with the higher resolutions showing more detail. A resolution of 1,024x768 can render flicker-free images. Displays may have noticeable image degradation when set at any resolution lower than 1,024x768 pixels, where images look smeared and text can become harder to read.

Brightness. Reported in cd/m2 (candela per square meter), this is a measurement of the display's maximum brightness. A range of brightness allows the user to adjust the brightness for well-lit uses (where maximum brightness is needed) to dark settings.

Contrast ratio. The contrast ratio of an LCD is defined as the ratio of brightness (or luminance) of the pixel to the background, or the ratio of peak white to black level. The larger the contrast ratio, the deeper the blacks and the brighter the whites, improving the display's ability to show subtle color details and tolerate extraneous room light.

Number of colors. Refers to the total number of colors possible.

2001 Cost. Prices were obtained from the website of CDW Computer Centers, Inc. (www.cdw.com) on August 29, 2001.

Computer display costs — use stage

Costs from the use stage of the computer display life are primarily electricity costs. The average cost of residential and commercial electricity in the U.S. is approximately $0.021/MJ and the CRT and LCD monitors use about 2,290 and 853 MJ/functional unit, respectively, in the use stage. The electricity costs to consumers during the use stage are therefore $48 for the CRT and $18 for the LCD. The amount of electricity consumed and the associated cost of that electricity for each life-cycle stage are presented in Table 7.2.

This cost information represents only a small part of all the components of cost that would be considered in a thorough cost analysis. A complete cost analysis would require assessing the costs from each life-cycle stage, and would include both direct costs (e.g., material costs) and indirect costs (e.g., environmental costs to society). While such a detailed analysis was beyond the scope of this study, some of the costs that should be considered in a complete cost analysis include:

- material costs;
- production costs (e.g., labor, transportation of material);
- maintenance costs (e.g., equipment maintenance, line set-up);
- capital costs (e.g., equipment procurement, installation, and facility floor space);

- utility costs (e.g., water, electricity, natural gas);
- licensing/permit cost (e.g., wastewater discharge, air emissions); and
- environmental treatment costs (e.g., wastewater, air, hazardous waste treatment).

Table 7.2. Life-cycle electricity costs

	CRT			LCD		
Life-cycle stage	**Electricity use** (MJ/functional unit)	**Unit cost** ($/MJ)	**Cost** ($US)	**Electricity use** (MJ/functional unit)	**Unit cost** ($/MJ)	**Cost** ($US)
Upstream	73.2	0.012[a]	$1.3	8.55	0.012[a]	$0.10
Manufacturing	129	0.012[a]	$1.5	278	0.012[a]	$3.4
Use	2,290	0.021[b]	$48	853	0.021[b]	$18
End-of-life	0.229	0.012[a]	$0.003	0	0.012[a]	$0
Total	**2,492**	**---**	**$51**	**1,140**	**---**	**$22**

[a]1999 U.S. average cost of electricity for the industrial sector is $0.0443/kWh. Assuming 3.6 MJ/kWh, ($0.0443/kWh)/(3.6 MJ/kWh)= $0.012/MJ. Source: www.eia.doe.gov/cneaf/electricity/esr/t11.txt.

[b]1999 U.S. average cost of electricity for the residential and commercial sectors is $0.0771/kWh. Assuming 3.6 MJ/kWh, ($0.0771/kWh)/(3.6 MJ/kWh)= $0.021/MJ. Source: www.eia.doe.gov/cneaf/electricity/esr/t11.txt.